SECTION 16431 - SHORT CIRCUIT AND COORDINATION REPORT

City of San Diego, CWP Guidelines

PART 1 -- GENERAL1.

1.1. WORK OF THIS SECTION

A. The WORK of this Section includes providing a short circuit and protective device coordination study and harmonic measurement for the electrical power system.

B. The studies shall include the electrical distribution system for normal and standby power sources including the [ ] [208V] distribution system.

C. The studies shall include protection studies for motors supplied with factory-installed solid state overload and overcurrent protection devices.

D. The WORK of this Section includes measurement of harmonic current and the installation of filters required for harmonic suppression.

1.2 RELATED SECTIONS

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 16050 Basic Electrical Materials and Methods
2. Section 16400 Electrical Service and Distribution

1.3 CODES

A. The WORK of the Section shall comply with the current editions, with revisions, of the following codes and City of San Diego Supplements:

1 National Electrical Code

1.4 SPECIFICATIONS AND STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

1. ANSI/IEEE 141Recommended Practice for Electrical Power Distribution for Industrial Plants

2. ANSI/IEEE 242Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems

[3. ANSI C 37.010Standard Application Guide for AC High-Voltage Circuit Breakers]

4. ANSI C 37.5Calculation of Fault Currents for Application of Power Circuit Breakers

[5. ANSI C 37.13Low-Voltage AC Power Circuit Breaker (600-Volt Insulation Class)]

6. IEEE 519 Recommended Practice and Requirements for Harmonic Control in

1.5 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted in compliance with Section 01300:

1. Studies related to distribution system protection and coordination shall be submitted to the CONSTRUCTION MANAGER prior to submittal of distribution equipment shop drawings and/or release of equipment for manufacture. A preliminary submittal shall be made with sufficient detail to review the adequacy of products and to indicate the computer program selected for use in performing the WORK of this Section.

2. Studies for harmonic current, voltage and line notching test results shall be forwarded to the CONSTRUCTION MANAGER prior to acceptance of the project and after installation of harmonic generating and harmonic sensitive equipment.

3. Submittals for solid state motor protective devices shall be forwarded to the CONSTRUCTION MANAGER prior to loading the motor.

4. Protective device and coordination evaluation studies must be approved by the CONSTRUCTION MANAGER prior to acceptance testing.

5. Submittals shall indicate proposed changes to the protection scheme and equipment selection which will result in improved system reliability and safety.

6. Documentation of at least one successful study of comparable size and complexity completed in the recent past, including contact names, addresses, and telephone numbers.

1.6 QUALIFICATIONS

$# _____

NTS: In the paragraph below, define the terms "comparable size and complexity" for the equipment or system specified. Requiring experience of more than one successful project requires sound justification and prior written approval from the City Project Manager.

_____ #$

A. Short circuit studies, protective device evaluation studies, and protective coordination studies shall be performed by [the medium voltage switchgear manufacturer] [or] [an electrical testing service regularly engaged in short circuit and protective device coordination studies, having at least one successful study of comparable size and complexity completed in the recent past. Study of comparable size and complexity shall have the following characteristics: [ ].

1.7 STUDY REPORTS

A. The results of the power system study and harmonic current, voltage and line notching measurements shall be summarized in a final report, signed by the professional electrical engineer, registered in the State of California responsible for the studies. Six bound copies of the final report shall be submitted in compliance with Section 01300 and shall include the following:

1. Single-line diagram

2. Impedance diagram

3. Tabulation and identification of protective devices on a single-line diagram.

4. Time/current coordination curves

5. Computerized fault current calculations

6. Test instrumentation, condition and connections, as applicable, for each study

7. Harmonic measurement results

8. Specific recommendations (if any)

PART 2 -- PRODUCTS

2.1 GENERAL

A. **General:** The report shall include a single-line and an impedance diagram of the power system. This diagram shall identify components included in the study and the ratings of power devices including transformers, circuit breakers, relays, fuses, busses, and cables. The resistances and reactance of cables shall be indicated in the impedance diagram. The study shall include written data regarding maximum available short circuit current, voltage, and X/R ratio of San Diego Gas and Electric Co.

2.2 SHORT CIRCUIT STUDY

A. The short circuit study shall be performed with the aid of a computer program complying with ANSI C 37.5, IEEE Standard 242, and IEEE Standard 141.

2.3 PROTECTIVE DEVICE EVALUATION STUDY

A. A protective device evaluation study shall be performed to determine the adequacy of circuit breakers, molded case switches, automatic transfer switches, and fuses. Any problem areas or inadequacies in the equipment due to prospective short-circuit currents shall be promptly brought to the CONSTRUCTION MANAGER's attention in writing but in no case more than [ ] [7] days after discovery.

2.4 PROTECTIVE DEVICE COORDINATION STUDY

A. A protective device coordination study shall be performed including calculations required to review the selection of power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated current transformers, and low-voltage breaker trip characteristics and settings.

2.5 TIME/CURRENT COORDINATION CURVES

A. The time/current coordination curves for the power distribution system shall include, on 5-cycle log-log graph paper, at least the following:

1. Time/current curves for each protective relay or fuse showing graphically that the settings will provide protection and selectivity within industry standards. Each curve

shall be identified, and tap and time dial settings shall be shown.

2. Time/current curves for each device shall be positioned to provide the maximum selectivity to minimize system disturbances during fault clearing. Where selectivity cannot be achieved, the CONSTRUCTION MANAGER shall be promptly notified of the cause in writing but in no case more than [ ] [7] days after discovery.

3. Time/current curves and points for cable and equipment damage.

4. Circuit interrupting device operating and interrupting times.

5. Maximum fault values.

6. Sketch of bus and breaker arrangement.

7. Magnetizing inrush points of transformers.

8. Compliance with Code requirements and proper coordination intervals and separation of characteristics curves.

9. Thermal limits of motors 250 hp and above.

2.6 HARMONIC MEASUREMENT

A. The report of the distribution system, at all voltage levels, shall indicate the harmonic currents anticipated at each voltage level. The report shall indicate sources of harmonic currents, voltages, and line notching of equipment. The report shall state the tolerance of sensitive equipment to harmonics.

B. The report shall include measurement of harmonics present in the output of harmonic-generating equipment at the input terminals of sensitive equipment. Filters required to prevent equipment malfunction due to harmonics shall be installed. Harmonic measurements shall be performed and documented after the filter installation.

C. Equipment which is required to conform with IEEE 519 shall be measured to determine output harmonic content. Corrective action necessary for compliance with IEEE 519, Tables 2 and 4 General System Class shall be made. Measurements and documentation shall be performed to demonstrate compliance with 5 percent voltage distortion limitation.

2.7 MOTOR PROTECTION

A. Where overload protection as phase overcurrent for medium voltage motors is specified to be solid state protective modules, modules shall be adjusted for actual installed motor torque, current and thermal characteristics. Protective settings shall be submitted, and reviewed, before motors are run under load.

PART 3 -- EXECUTION

3.1 TESTING, CALIBRATION, AND ADJUSTMENT

A. The medium voltage equipment manufacturer shall provide the services of a qualified field engineer and necessary tools and equipment to test, calibrate, and adjust the protective relays and circuit breaker trip devices as recommended in the power system study for [ ] [2] days.

** END OF SECTION **